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A PRELIMINARY STUDY OF THE ARANEAE THERAPHOSAE  
OF CALIFORNIA.

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Comparatively little work has been done upon the trapdoor spiders and tarantulas of North America. Popularly, the trapdoor species, *Bothriocyrtum californicum* (Cteniza) and the tarantulas, *Eurypelma* (*Mygale hentzi*, etc.), are well-known from the numerous specimens put up and sold by natural history dealers; but our various other forms are practically unknown to most zoologists and entomologists, and have received very little attention.

N. M. Hentz, the pioneer of American arachnology, writing between the years 1821 and 1850, described six species of Araneae theraphosae, all from the South-eastern States. Two of these are male and female of one species, however, and are the same as one of the five species attributed to North America by H. Lucas, a Frenchman, whose papers appeared from 1834 to 1845. Walekenaer, also a Frenchman, in a work published in 1837, named four North American forms, only one of which goes by his name today. In 1852, Girard published *Mygale hentzi*. Rev. O. P.

Cambridge, of England, published *Cteniza californica* in 1874, and nine years later, *Atypoides riversi*. Anton Ausserer, of Vienna, has published (1871-1875) four species of *Eurypelma*, one the same as *E. hentzi* Girard, and two from the manuscript of Doleschall. Prof. Geo. Atkinson, of Cornell University, was the next American to add to the literature upon these forms, describing seven species in 1886, all from Virginia and North Carolina. At least two of these had been already described. Geo. Marx (1888) and Nathan Banks (1896), both of Washington, D. C., have each described one species. Eugene Simon, of Paris, who has made a more comprehensive study of the spider fauna of the world than any other student, has described eighteen North American species. Cambridge and Atkinson have added to their descriptions accounts of the ecology of the forms they describe; but many of the species have not had their habits and haunts investigated and recorded, indeed many of them, apparently, have not been collected, or recorded since the original descriptions appeared.

Four listings of the North American species of the Araneae theraphosae have been made. Geo. Marx (1889), in his "Catalogue of the Described Araneae of Temperate North America," lists 29 species. Simon, in his "Liste des Especes de la Famille des Aviculariides qui habitent l'Amerique du Nord" (1891), enumerates 37 species, 18 of which are his own, and 13 of which are therein described for the first time. Nathan Banks (1892), in his paper entitled, "Our Atypidae and Theraphosidae", recognizes but 23 species, he evidently not having considered Simon's paper of the preceding year. Lastly, J. H. Comstock (1903) in his publication, "A Classification of North American Spiders," lists 36 species; or 37 if Simon's reference to an *Avicularia* from San Diego be considered.

Of these 37 forms, 18 are attributed to the Pacific Coast, 17 to California. All have been described by men situated in the Eastern United States or in Europe, from material sent to them. It is no wonder, therefore, that our species have been described mostly from meagre and young material, and the ecology of so few has been recorded.

The following list sums up the species reported from California, embodying the redistribution of certain forms, as found necessary from the study of my material:

## Aviculariidae

## Ctenizinae

- Hebestatis theveneti Simon (Cycloscosmia)
- Bothriocyrtum californicum, Cambr. (Cteniza)
- Eutyichides versicolor, Simon (Actinoxia)
- Aptostichus atomarius Simon
- Aptostichus clathratus Simon
- Aptostichus stanfordianus sp. nov.
- Amblyocarenum talpa Simon (Cyrtouchenius)

## Aviculariinae

- Avicularia sp. (?)
- Eurypelma californica Auss.
- Eurypelma leiogaster Auss.
- Eurypelma steindachneri Auss.
- Eurypelma rileyi Marx.
- Eurypelma marxi Simon

## Diplurniae

- Brachythele longitarsis Simon
- Brachythele theveneti Simon

## Atypidae

- Atypoides riversi Cambr.
- Aliatypus californicus, Banks (Atypoides)
- Hexura picea Simon.

Marx and Banks have followed the older classification of Ausserer. Comstock has, however, followed the newer classification of Simon, as given in his "Histoire Naturelle des Araignees," Vol. I (1892, as to part dealing with the Araneae theraphosae). I likewise, follow Simon, in general; but in the supplement of this work, published in 1903, Simon makes certain changes in classification, which concern certain of our North American forms, affecting Comstock's tables, and attracting special attention to one of the species found about Stanford University.

The family Atypidae, formerly, was divided into three sub-families, the Brachybothriinae, Hexurinae, and Atypinae, each comprising two genera. All three sub-families are represented in North America. All the rest of our Araneae theraphosae were placed in the family Aviculariidae. By Simon's new arrangement, the family Atypidae is limited to the two genera of the old "Atypinae," the other two sub-families being transferred to the Aviculariidae; the change, however, not at all affecting the

sequence established earlier. The old family Atypidae was characterized by the elevated position of the anal tubercule, the normal number of the spinnerets being six (the genus *Brachybothrium* excepted), and the lower border of the chelicerae being narrow and without a distinct groove for the reception of the fang. The family as now limited, is distinguished by the great development of the coxal lobe of the pedipalps, the four pairs of sternal impressions, and the presence of a conductor on each genital bulb of the male. The *Brachybothriinae* have no coxal lobes on the pedipalps, no suggestion of a conductor on the genital bulbs; but have a rake on the chelicerae, the thoracic furrow is longitudinal, and the sternal impressions are four in *Brachybothrium*, six in *Atypoides*. The *Hexurinae* have only two sternal impressions and no rake, the thoracic pit is longitudinal, there is a suggestion of a coxal lobe on the pedipalps and the genital bulbs have a short spur, probably analogous to the conductor of the *Atypinae*.

The species which becomes of special interest in connection with these groups of Simon's, is Banks' *Atypoides californica*. The male of this species seems to be unknown to science, so I take pleasure in reporting the finding of two males, October, 1907, in the immediate vicinity of Stanford University. A casual comparison of these specimens with the drawings of the male of *Atypoides riversi* Camb., shows marked differences between the two species, and a careful study of the facts at hand, shows the necessity of the formation of a new genus to accommodate the species described by Banks. The female of this species is quite close in structure to the female of *Atypoides riversi*, having a rake and six sternal impressions; but the thoracic pit is round, not longitudinal. The male has a rake, the thoracic pit round, short coxal lobes on the pedipalps, much as in *Hexura*, and also has a conductor on each genital bulb, nearly the full length of the bulb. How it differs otherwise from *Atypoides* will be discussed in the proper place below. In truth, the female of *Aliatypus*, as the new genus will be called, seems to merit a position nearer the *Brachybothriinae*, while the male, in certain respects, belongs rather between the *Hexurinae* and the *Atypinae*. Such a condition of affairs makes a readjustment of Simon's classification of these forms worthy of consideration. The affinities of *Aliatypus* toward *Atypus*, however, are thru "secondary sexual characters" in the male, which, if of as little weight in classification as some



authors argue, are not so important as the characters, common to both sexes, placing the genus between *Atypoides* and *Hexura*.

Altho I have not studied specimens of *Brachybothrium*, *Hexura* and *Atypus*, and have not seen the genus *Scotinoecus*, which Simon considers as linking *Brachybothrium* to the *Diplurinae*, it seems to me that Simon's *Atypidae* of 1892 is more worthy of recognition as a family than his limited *Atypidae* of 1903. Accepting, accordingly, the older *Atypidae* as a family, the group logically admits separation into five natural smaller groups, whether of sub-family or tribal rank is not important. Arranged in the form of a key, these groups may be characterized as follows:

- |  |  |
|--|--|
| Spinnerets 4, sternal impressions 4, chelicerae with a rake, no coxal lobe, thoracic pit longitudinal..... | <i>Brachybothrium</i> (1)                  |
| Spinnerets 6:  |  |
| Chelicerae with a rake, sternal impressions 6, coxal lobe none or slightly produced in male.               |  |
| Coxal lobe none, thoracic pit longitudinal, bulb of male without conductor .....                           | <i>Atypoides</i> (2)                       |
| Coxal lobe apparent in male, thoracic pit round, bulb with long slender conductor.....                     | <i>Aliatypus</i> (3)                       |
| Chelicerae without a rake.   |  |
| Coxal lobe small, sternal impressions 2, thoracic pit longitudinal, bulb with a stout spur.....            | <i>Hexura</i> (4)<br><i>Mecicobothrium</i> |
| Coxal lobe very large, sternal impressions 8, thoracic pit transverse, bulb with long conductor.....       | <i>Atypus</i> (5)<br><i>Colonnata</i>      |

One other difficulty that comes up in following Simon's late classification is in regard to his groups *Cyrtacheniceae* and *Amblyocareniceae*, of the sub-family *Ctenizinae*. These groups are separated from each other upon the basis of the relative size of the posterior sternal impressions and the relations of these two impressions to each other and to the margin of the sternum. As to these characters, I find that in two of the species of the *Ctenizinae* found in this vicinity, that the young answer the requirements of one group while the adults claim admission to the other group. In truth, the sternal impressions seem to be characters that vary according to the age or size of the individual, at least in some species, and should be used with caution in classification. This point will be taken up further, in the discussion of the species concerned.

From the number of forms of the *Araneae theraphosae* described from California, and with Simon's latest work and Comstock's recent "Classification of North American Spiders" at hand, it was supposed that the species found about Stanford

University could be readily identified, leaving only the life habits of the forms needing investigation. It was soon found, however, that the species collected were far from being easily determined, and developments soon showed that a problem in systematic work was really at hand. Thus it was deemed advisable to press first the solution of the taxonomic questions, even if the biological phases of the problem had to be neglected. Efforts were therefore made to secure good series of all the species obtainable, and in some cases very satisfactory results were obtained.

The territory covered is not extensive, not nearly as much so as desirable, but many days have been spent in careful field work in the immediate vicinity of Stanford University. The mountains west of Stanford have been visited to the extent of the Woodside-Kings Mt. Road, and the ravine west of, and below, King's House, the base of the Woodside-La Honda Road, the Goat-Ranch Canon and the New Grade Road, the Page-Mill Road, and the Los Gatos Canon, from Wrights down. In the Mt. Hamilton Range, the lower portion of the Alum Rock Canon was visited, and material was secured at various points along the Mt. Hamilton Stage-road from San Jose. A special trip was made to Santa Rosa, Sonoma County, as this was then supposed to be the type locality of Simon's *Aptostichus clathratus*. Material was secured at the base of the hills due east of Petaluma, at White Sulphur Springs, south-east of Santa Rosa, and along the Guerneville-Forestville Road, near the Russian River. Finally, the gulches in the pine forest of the Monterey Peninsula, and the Monterey-Sur County-road, yielded valuable returns for the time spent in that vicinity.

The only way of locating the nests of the spiders is by careful search for the traps or open burrows, in likely places, as learned by experience. Frequently, after a considerable rain, the burrow is deepened and pellets of soil, held together by silken thread, are carried out and piled up near the burrow, such piles being often much more noticeable than the trapdoors, and even more so than the uncovered openings. In moss-covered banks, a very popular resort, the trapdoors are commonly almost beyond discovery by human ken, but frequently a practiced eye may detect a flattened space in a mass of moss which may be lifted up and seen to be a trapdoor. Sometimes the free edge of the door will be quite noticeable to one accustomed to detecting them. In general, they are quite indiscernible to the casual observer,

altho in a conspicuous place. The chimneys, or "turrets," of *Atypoides* are more or less conspicuous and attract common attention. "Tarantula holes" are well known to almost everyone, where tarantulas occur.

A nest once located, the soil is carefully dug away with a small miner's pick, the details of the measurements, directions, branches (if any), and silk lining being studied and recorded in a field-book, each specimen being given a permanent number and page in the book. The more careful exposing of the burrow is done with a pair of small forceps, with curved points, the pick being used for the rougher digging only. The spider is stored away in a cork-stoppered bottle, a slip of paper bearing the number assigned the individual always being fastened in between the cork and glass. The composition of the trapdoor or turret and its surroundings are usually recorded, and any other notes considered to be of possible interest or use.

In the laboratory, the spiders are put into about 75% alcohol and laid aside for later study, each in a separate vial and under the number given it in the field. Spiders corked up as brought in from the field have been found to be thoroly alive after having been thus confined for a full week, without fresh air. They die very slowly in potassium-cyanide killing bottles. For study they are placed in a watch-crystal and kept under alcohol, or they are laid out on a blotting-paper or white cloth and allowed to dry for half an hour or so, when most of the external structures are studied with a hand-lens, a dissecting, or a compound, microscope; but if left out over an hour, without moistening with a couple of drops of alcohol, the abdomen is apt to shrink, thus deteriorating the specimen. For especially careful study of such portions as the rake of the chelicerae, tarsal claws, etc., dissections carefully mounted in balsam give the most satisfactory results. Even then it is noticed that with such uneven topography as many spiders possess, "things look different" from different angles and much care is necessary to make a series of comparative drawings worth anything.

The following key is given to aid in identifying the species discussed in the remaining pages.

- (I) With four spinnerets.
- (1) Chelicerae with a rake
- (a) Tarsi I and II not scopulate..... *Bothriocyrtum*
- (aa) Tarsi I and II densely scopulate
- (b) Coxa P with spinules scattered from base to apex (Plate XIV, fig. 16)..... *Eutyichides*
- (bb) Coxa P with spinules limited to inner basal corner (Plate XIV, fig. 17)..... *Aptostichus*
- (c) Cephal. distinctly appressed-pubescent, eye-tuber very high (Plate XIV, fig. 31)..... *A. atomarius*
- (cc) Cephal. apparently glabrous, eye-tuber much lower (Plate XIV, figs. 22 and 23)..... *A. stanfordianus*
- (2) Chelicerae without a rake
- (a) Tarsi of legs lacking third claw; abdomen long-setose and short-velvety..... *Eurypelma*
- (aa) Tarsi of legs with third claw; abdomen short-silky pubescent, not setose..... *Brachythele*
- (II) With six spinnerets
- (1) Thoracic pit longitudinal;  $\sigma^7$  without conductor on genital bulb; pedipalps half as long as legs I..... *Atypoides*
- (2) Thoracic pit round;  $\sigma^7$  with conductor on genital bulb and pedipalps as long as legs I..... *Aliatypus*

*Bothriocyrtum californicum*, (ambr. (Cteniza). In Mogg., Harvesting Ants and Trapdoor Spiders, II (Supp.), 1874.

This is the well-known trapdoor spider of Southern California, whose thick, bevel-edged trapdoor and nest is commonly sold by natural history dealers. The species was probably more or less common in the Santa Clara Valley, before the days of plowing and cultivation. I have been unable to find any trace of it since my searchings began. Dr. Jenkins reports the finding of a nest on his Fresno Cottage premises, some time about 1890. The specimen is supposed to be deposited with the Entomological Museum of the University, but unfortunately there seems to be no specimen here labeled as such. It may be one of two unlabeled specimens that are here. The only other report that I have come across is in Science, III, 62, Notes and News, p. 476 (1884), which, however, states that a new Cteniza has been found at San Jose, different from the one found in Southern California, and may, indeed, refer to something else. As it gives no reference, the report is probably worthless. *Bothriocyrtum*, however, probably persists yet in some isolated, uncultivated areas in this county, and may be expected to come to light at any time in the future.

*Eutyichides versicolor*, Simon. (Actinoxia). Act. Soc. Linn. Bord., XLIV, p. 318.

(Plate XIII, figs. 1-19; XIV, figs. 1-16; XVI, figs. 1-2).

Simon's Actinoxia was based upon a very young individual, only 8 mm. long, and is not retainable as a genus. Simon himself

has already recognized this fact, and says: "Le genre *Actinoxia* sera sans doute à supprimer et à réunir à *Aptostichus*, il est basé sur un très jeune individu et ses caractères tiennent peut-être à l'âge" (Hist. Nat. des Ar. II, Supp., p. 900). I have collected, and have before me, one male and over seventy-five females, ranging in length from 7 to 26 mm., not including several broods of young taken from the nests of the parents, to be mentioned later. A careful study of several individuals, ranging in length from 7 to 12 mm., has satisfied me that I have the species treated as above by Simon. There is a specimen of this form, 14 mm., long, in the collection here, labeled, "*Actinoxia versicolor* Simon, det. by Banks." The adults, however, cannot be referred to *Actinoxia*, nor can they be placed in *Aptostichus*; but their more important and more constant characters conform best to Simon's diagnosis of *Eutychedes* (Ann. Soc. ent. Fr., 1888, p. 213), (Hist. Nat. des Ar., I, p. 109), especially as to the posterior sternal impressions and the armature of the pedipalps. The species seems to be closely related to *E. dugesi* Simon (Ann. Soc. ent. Fr., 1888, p. 214), but is certainly distinct.

It is the most common trapdoor spider of the Santa Clara Valley, the foothills and canons on either side. It is the only form that I found while in Sonoma County. I did not find it in the portion of Monterey County visited. Mr. Banks recorded it from Sierra County (Proc. Cal. Acad. Sci.-Zool., III, 12, 1904, p. 332). It is probably well distributed throughout the Coast Range of California.

As both male and female adults are undescribed, I insert rather full descriptions, including generic as well as specific characters.

**Adult**.—(Plate XVI, fig. 10.) Length 25 mm.; cephalothorax 2 mm. long, 7 mm. wide; abdomen 12 mm. long. Cephal. olive-brown toward cephalic portion darker, dorsal higher, apparently glabrous, the scattered minute hairs being short, not only under a low lens, but under a very high double convex magnifying glass; thoracic pit procurve; a row of much larger, black, cephalic hairs some along median line of cephal. with a narrow glabrous space on each side, upper high, prominent, rapidly narrowing within the middle third, slightly narrowing thru posterior third (Plate XIII, figs. 7-8, 11-12), erect, or low, hardly one-fourth as high as long (i. e., longitudinal thickness) (Plate XIV, figs. 5-7) base of the Abid. arenum type, anterior nearly equidistant, P. L. nearly as large as A. L., P. M. not constant in size or shape (some individual variation shown in Plate XIV, figs. 9-12—fig. 13 showing an at normal lack of two posterior eyes on one side), A. L. and A. M. dark blue-gray, P. L. dull yellowish, P. M. shining silvery-white. Chelicerae dark reddish, long setose at the apex with attenuating tongues of setose arcs reaching to the base above (Plate XIII, figs. 11-12), with a slight of tube process at the apex within (more noticeable if mounted in balsam) rake (Plate XIII, figs. 15-18) of many teeth, but only four in front, two of which are on the low process, a prominent row of five or more teeth extending up the

inner edge of the chelicerae, (in most young individuals the front row of four are conspicuously larger than the other teeth above and behind—figs. 17–18—and no doubt are responsible for the "Actinoxia" rake described by Simon); fang with a thin scollop-edged median extension within (figs. 16 and 18). Abdomen oval or elliptical, dull tawny, marked with purplish-brown median stripe and transverse bands, very dark, broad, and more-or-less confluent, nearly obscuring the ground-color, or pale and nearly obsolete (Plate XIII, figs. 9–10). Spinnerets as shown in last mentioned figures. Sternum pale tawny, black-setose; three pairs of shallow impressions, posterior pair large, irregularly elongate, oval, ovate, or kidney-shaped (some variations shown in figs. 1–6, Plate XIII), close together and converging cephalad, appearing paler than the surrounding cuticle, because of the absence of fine black setae; anterior pair not apparent in young individuals (fig. 6) and posterior pair smaller, farther from each other and nearer the margin, the younger the individual. Labium a little wider than long, more or less emarginate in front, generally unarmed (67%), but frequently with one to three scattered spinules (33%) (Plate XIII, figs. 13–14). Coxae of pedipalps with many spinules from base to apex of ventral surface, more concentrated cephalo-mesad (Plate XIV, fig. 16; setae not shown); tarsi of pedipalps densely scopulate below, well armed two subapical spines and two others on each margin (71%) (Plate XIII, fig. 15P); next joint armed with numerous spinose setae, but without well-defined arrangements. Legs tawny, or with a decided olivaceous cast; tarsi I and II with two sub-apical spines (86%) metatarsi I and II with four apical spines and two near each margin (78%), frequently, however, one of the apical and the inner of the sub-basal spines are reduced to little more than spinous setae, scarcely distinguishable from the numerous variable setae omitted from the drawing (Plate XIV, fig. 15 I); patella III with a triangular patch of spines, comprising a basal row of from four to six, and four to eight scattered ones above, the number commonly not uniform on the two sides of the same individual (Plate XIV, fig. 14), tibiae III with a few spines above and metatarsi III with marginal rows of spines above and below; femora IV with an apical comb dorso-cephalad, metatarsi IV with a row of spines on each side below and on the inner edge above, with at least two apical spines above and two or more below, tarsi IV with armature very indefinite, the spines varying from none to seven. Tarsal claws usually with one or two larger basal teeth and an inner graduated row of from four to eight smaller teeth, the largest nearest the apex (Plate XIV figs. 1 and 2); occasionally the number is much reduced (Plate XIV, figs. 3 and 4).

The percentages given above are deduced from tabulations made from a careful comparison of forty-three individuals.

Adult ♂ (Plate XVI, fig. 2)—Length 13 mm.; cephalothorax 5 mm. long, 1 mm. wide; abdomen 6 mm. long, 3 mm. wide. Setae everywhere much more robust and blacker than in female. Cephal. rich tawny (the caput dappled with olive-drab), excepting the glabrous longitudinal bands on either side of the median row of setae, conspicuously bristly, especially the margins, posterior margin scarcely emarginate; thoracic pit recurved, as in female; caput much lower and relatively much smaller than in female, only half as wide as thorax, sides nearly straight, arrangement of setae as in female; eyes and eye-tuber as in female. Chelicerae much smaller and more slender than in female, darker in color; rake of fewer teeth above. Abdomen with median band not in evidence, but transverse bands nearly confluent, the pigment arranged in rings all over the dorsum, but more confluent in the bands; spinnerets conspicuously paler, light yellowish, more slender, the terminal joint relatively longer and nearer size of medial joint. Sternum as in female, outline and impressions well represented by fig. 3, Plate XIII, but the most anterior pair of impressions less apparent. Labium with setae only, no spinules; anterior edge not emarginate. Pedipalps short, less than half as long as legs I (see photo); coxae P with spinules from base to apex, but these less numerous, very slender, almost microscopic, and more confined to the anterior half; tibiae nearly twice as long as the patellae, attenuated toward the apex; bulb nearly simple, the lower surface with a nearly



complete ring running out upon the curved spine (Plate XIII, fig. 19). Legs rich tawny above, dulled by an olive tint over the areas beset with stout black setae, paler below; tarsi I and II unarmed below, scopulate, metatarsi I thinly scopulate, with basal half bent, with four apical spines and a low conical projection near the middle of the outer edge, metatarsi II scopulate, with four apical, one inner lateral, and three outer lateral spines, tibiae I and II with apical and lateral spines (no comb nor spur as in *E. guadalupensis*) and the numerous spinose setae common to all the joints except the tarsi; tarsi III and IV unarmed, thinly scopulate below, slender setose above, metatarsi III and IV with four apical spines, and two lateral and one median rows of slender spines, tibiae III and IV with several more scattered spines, patellae III and femora IV as in female, but the setae more robust, making the spines less conspicuous. Tarsal claws as in female, but the teeth relatively longer, more slender and conspicuous. (Described from the single individual taken.)

Altho this species belongs in Eutychides rather than in any other described genus, there are certain characters which may be considered by some as sufficient basis for a new genus; but I think it best to leave the matter as herein considered, at least until opportunity is had to examine the Mexican species of the genus.

The burrow of this species is long and narrow, with usually one of two types of a lateral branch, and a thin "wafer" trap-door at the surface. In adobe soil, or compact sand, the branch is generally below the upper third of the burrow and is a very neat lateral chamber, about three centimeters long (with adult spiders) 10 to 12 mm. diameter within, with a circular sharp-edged opening (5 to 8 mm. diameter) into the main tube, which is enlarged at this place. In soft loamy soil in wooded canons and along streams, the branch is usually near the surface, is of less definite size and shape, and joins the main tube by a larger, less regular opening, the whole branch having the appearance of being the old abandoned upper end of the nest. Such it may be, but it evidently serves the purpose of the lateral chamber, for in no case have I found below the neater, more horizontal chamber. In only one case have I found the spider in the chamber. It is not closed by a trap door. The burrow is well lined thruout with an opaque-white sheet of silk, a whiteness which I have learned to recognize as belonging to this species, in comparison with the other trapdoor species found here. On wooded hillsides and along thicketed banks, where the species is apt to be most abundant, and where much dead grass, fallen leaves, and other vegetable debris occurs, the silken tube is frequently extended up thru the loose mass for from one to eight centimeters, supported and decorated on the outside by whatever may be near, weed-stems, dead grass, loose soil, moss, leaves, etc., but always the



entrance closed by the trapdoor, except for which a few could be easily mistaken for "turrets" of *Atypoides*. In these above-ground extensions the rim is usually a little inflated, funnel-like, the door resting more-or-less loosely upon the rim. In such cases the door is commonly a small leaf, or leaf-portion, with just enough silk to hinge it in position and form a lace-work on the under side, in which the spider can fasten its claws. In open situations, the trap is generally level with the soil surface, in level or somewhat slanting spots, and is composed of a thick lining of silk below with a complete layer of soil above, more-or-less decorated with moss or leaf-bits, always assimilating its surroundings. One of the largest burrows examined was 27 cm. deep, 14 to 18 mm. diameter, with trapdoor 14 x 12 mm.; lateral chamber only 6 cm. down, with 7 mm. opening and 13 mm. greatest diameter. Another was 28 cm. deep, 15 to 18 mm. diameter; trapdoor 25 x 16 mm. (unusually large); lateral chamber 18 cm. down with 9 mm. opening and 3.5 cm. long. The one male found was in a typical burrow with typical trapdoor, lateral chamber, and silk lining.

No knowledge was gained concerning their feeding habits, except that near dusk the spiders are found out at the surface, with the trap raised just a little, enough for the hidden animal to see out, evidently watching for a chance to grab some passing insect. If the door is touched, the spider may jump out at the stick, or other object, extended, and then hurriedly retreat into the depths of the nest; again it may fasten its claws in the silk lining of the trap and hold the door down firmly. If the door is forced open, it will hastily retreat to the bottom of the tube.

The eggs must be laid sometime in the summer, as females with the abdomen much enlarged and the egg-filled ovaries showing thru the ventral skin have been taken in March and June. Females with young running about in the nest were taken in September, October, and December.

Young taken from the nest of the parent and placed in individual vials, with an inch of loose moist soil, burrowed into the soil, within a few hours, with few exceptions, and placed neat little traps (measuring about 5 x 4 mm.) at the proper place. At various times certain of the doors were removed, new ones being usually built within a few hours. One which neglected putting a door to its burrow, finally did so, after being disturbed with water, two months later. In general, they were sadly neglected as to being supplied with food; but once, upon removing some of

the traps, certain ones came out at once, as if to learn the cause of the disturbance. A live mosquito, presented by forceps to one little spider, was savagely seized and carried into its tube. An injured house-fly, placed near the burrow of another young spider (5 mm. long, or less), was vainly tugged and pulled at for some time. When noticed at the surface, with the trap raised just a little and disturbed, they would commonly hold the door down as do the adults.

Not a few specimens were found to have a colony of minute mites on the anterior slope of the abdomen above; the whole colony, of thirty or more, measuring little more than a millimeter across. Minute Collembolae are commonly found running about in the nests.

**Aptostichus** Simon. Actes Soc. Linn. Bord., 1892, p. 317.

This genus, with its two described species, was made known by Simon in his "Liste des Especies de la Famille des Aviculariides qui habitent l'Amerique du Nord." I find no record of the genus having been collected or studied since; but Simon, in his *Histoire Naturelle* (II, Supp., p. 901), adds a few male characters not mentioned in the original diagnosis. The two species, as given, are:

*A. atomarius* ..... California (Morrison)

*A. clathratus*. . . . . California: Sta. Rosa del California (Geo. Marx).

I have collected, and have before me, two species which I believe belong to this genus, and, indeed, seemingly differ from it only in the character of the sternal impressions, which in one species are of the type described for *Eucteniza* and *Cyrtuchenius*, in the other nearer *Amblyocarenum*, not at all as in *Stenoterommata*, as illustrated in the *Histoire Naturelle* (I, p. 102). As in *Eutyichides versicolor*, the smaller the individual, the relatively smaller, less pronounced, and farther apart are the sternal impressions, both posterior and medial,—at least such is the case in the new species described below. Still, altho Simon's type specimens were presumably comparatively young individuals (14 and 15 mm. long, respectively), I find in my specimens of the same size, and smaller, no excuse for interpreting the sternal impressions as being of the *Stenoterommatan* type, ascribed to *Aptostichus*. The type of *A. clathratus* is in the U. S. National Museum, at Washington, and Mr. Nathan Banks has recently examined the specimen, at my request. He writes, "The sternum shows no

impressions, on each posterior side is a faint depression, but no true impressions, \* \* \* ” Mr. Banks also informs me that it is from Santa Rosa Island (near Santa Barbara), not Santa Rosa, Sonoma County. The type of *A. atomarius* is, unfortunately for me, in France, and the specific type locality not recorded. Until I have collected in many other portions of California, and satisfied myself that a genus exists, in this State, having the sternal impressions, and other characters, ascribed to *Aptostichus*, I do not feel justified in proposing a new genus to include my material now assigned to that genus.

***Aptostichus atomarius* Simon. loc. cit.**

I have two specimens, large females 25 and 27 mm. long, respectively, taken along the Sur County-road, near Carmel, south of Monterey, December, 1907. These show some variations from the description of *A. atomarius*, but agree with that form too well, in what seem to me to be the more reliable specific characters, for me to try to establish a new species upon this limited material. A sufficient series, however, including many ages and sizes, may lead to other conclusions later on. I searched several hours for additional specimens, on the day these two were found, and returned several days later, going over the same and adjacent ground, but all in vain.

Plate XIII, fig. 32, shows the sternal and labial characters as represented in these two individuals, excepting that, in the one drawn, the labium has three spinules, while in the other it is unarmed. The anterior two of the six impressions are quite distinct. The eye-tuber is much higher than in the next species, is very prominent (Plate XIV, figs. 30 and 31), but is not mentioned by Simon. The abdominal markings are of the pattern shown in Plate XIII, fig. 27. The pale appressed pubescence of the cephalothorax, as well as the shape, thoracic-pit, etc., is well shown in Plate XVI, fig. 3, and needs no lens for its discovery. The armature of the pedipalps and legs show some interesting variations: Tarsi P with two sub-basal spines, one individual having also a small sub-apical spine, externally; tibiae P with three apical spines, each lacking one of the four other spines to be expected, the missing spines not corresponding as to position. Tarsi I and II unarmed, considerably shorter than metatarsi; metatarsi I with one to three small apical spines and one to three other short stout spines, not constant in position;

metatarsi II with two or three apical spines and three or four others on the basal half, varying as to position. Patella III with a more or less triangular patch of from 10 to 18 stout spines, as in the next species. Tarsi IV unarmed in one specimen, in the other, each with four spines.

The specimens were taken from their nests, which were in sandy banks along furrows cut in the hillside during heavy rains. The burrows were short, but of large diameter, measuring only 13 and 15 cm. long respectively, and varying from 18 to 25 mm. in diameter; much enlarged externally, but the silk tube itself contracting somewhat, the space thus left between the heavy silk tube and the solid soil being filled with loosely mixed sand and silk, this mass being readily pulled out with the trapdoor, etc. In one case the surrounding soil had washed away considerably, leaving the mass of silk and sand protruding some 15 mm. from the bank. Near the center of the external surface of this mass, which had a more or less laminated appearance, was the rather thick trapdoor, of sand and silk, measuring about 20 x 15 mm.

#### *Aptostichus stanfordianus* sp. nov.

(Plate XIII, figs. 20-31; XIV, figs. 17-29; XVI, figs. 4-5.)

Adult ♀ (Plate XVI, figs. 4-5)—Measurements from my largest specimen, No. 137: length 21 mm.; cephal. 9 mm. long, 7.5 mm. wide; abdomen 11 mm. long. Cephalothorax tawny, slightly or decidedly olive-tinted, darker along furrows bounding caput; apparently glabrous, the scattered pale tawny minute hairs noticeable only under a good lens; posterior margin nearly straight or somewhat emarginate; a row of pale colored cephalad bent setae along median line of caput; caput medium in convexity, the caudal-converging sides forming nearly straight lines (Plate XIII, figs. 25 and 28); eye-tuber nearly black, about half as high as long (Plate XIV, figs. 22-24); eyes as in *Amblyocarenum*, variable (Plate XIV, figs. 19-21) A. E. blue-gray, P. L. yellowish-white, P. M. opaque-white, conspicuously luminous. Chelicerae darker than cephalothorax, with alternating glabrous and setose areas above, the setose lines fusing near the apex, apex merely rounded; rake of many teeth (Plate XIII, figs. 20-21), extending well up the inner edge above; fang smooth and rounded on inner edge. Abdomen oblong to elliptic; yellowish-brown, marked above with a median series of dark brown blotches, larger cephalad, and lateral series of cephalad-converging short linear spots, with various less definite spottings in between—the basis of these spots being rings of pigment, distinct in the lightly-marked specimens, but confluent and more-or-less obsolete, as rings, in the heavily-pigmented individuals (Plate XIII, figs. 26-27). Spinnerets four, the superior pair as shown in the last mentioned figures. Sternum tawny, decidedly olivaceous in the darker specimens, black-setose; six impressions, the anterior pair not apparent in many individuals, but readily seen in sterni dissected out and mounted in balsam, posterior pair medium in size, elongate elliptical to nearly round, almost as close to each other as to the margin (in adults) or much nearer the margin than to each other (in young individuals) (Plate XIII, figs. 29-31), darker in color than the rest of the sternum, probably because of thicker walls to the epithelial cells at these spots, as seen under the compound microscope. Labium wider than long, emarginate in front, with three to ten spinules, in a well defined transverse row or scattered (Plate XIII, figs. 22-24). Coxae

of pedipalps with many spinules cephalo-mesad below (Plate XIV, fig. 17); tarsi P densely scopulate below, with two sub-apical and two sub-basal spines (97%); next joint with four sub-apical spines (the middle two often quite slender) and two laterals on each side (83%) (Plate XIV, fig. 29 P), also setose. Legs tawny, more or less olivaceous mesad; tarsi I and II unarmed, not setose, metatarsi I not setose, but with two apical spines and two laterals near outer margin, one near inner margin (88%), metatarsi II slightly setose, with three apical spines and two laterals on each margin (79%) (variations from the formulae here adopted as typical are mostly due to the addition of one or more spines, usually slender ones not affecting the arrangement or presence of the spines of the typical system) (Plate XIV, fig. 29 "I" and "II"); patellae III with a patch of distinct spines, ten to fifteen, or more, usually with two curved rows below and the remainder scattered above, commonly not constant in number on opposite sides of an individual (Plate XIV, fig. 18); femora IV with a dense bunch of black setae at the outer apical edge, but not spinose as in *Eutychides versicolor*; tarsi IV commonly spined, but without constant formula, occasionally unarmed; legs otherwise as in other species of *Aptostichus*. Tarsal claws with two or three large inner basal teeth, more or less continuous with the basal end of the outer row of small teeth (Plate II, figs. 25-28). I can see no real difference between the anterior and posterior claws as to the teeth.

The above description is based upon a series of twenty-five individuals, ranging from 10 to 21 mm. length, the percentages given above, however, taken from tabulations made when but twenty-one were at hand. My No. 102 is taken as the type specimen, and deposited in the Entomological Museum of Stanford University. It was taken on the Stanford Estate, near the University. The rest of my material was taken in the foothills in this vicinity, in the ravines of the mountains west (not above 400 feet elevation, however), at Oceanview, San Francisco Co., and in the gullies of the pine forest on the Monterey Peninsula, it being the only trapdoor spider I have yet found there. Also a cast skin was taken from an abandoned burrow near Alum Rock, east of San Jose. It is the least common trapdoor species about Stanford, but abundant in its limited range near Pacific Grove. I have not yet secured a male.

The range of variation in intensity of color is correlated with the light relations of the environment and cannot be considered as of specific value. I have studied carefully the series before me, and while considerable variation exists between various extremes, selected with respect to certain variable characters (such as color, eye relations, thoracic pit, labial spinules, sternal impressions, etc.), I can find no definite set of differences constant enough to warrant specific separation of any two types amongst this material. Those situated in the open average much lighter in color, while those from the shades of the forested ravines are darkest in pigmentation. This species appears to be closer to *A. clathratus* than to *A. atomarius*.

The burrow is much shorter than in *Eutychedes versicolor* and relatively of greater diameter, in proportion to the size of the spider. The silk lining is thicker and whiter than in the other genus. Three specimens had branches of the surface type, not true lateral chambers. Above-ground extensions are common, especially at Pacific Grove, and the variations described for *E. versicolor* might be repeated here, it being practically impossible to distinguish between the "turrets" and traps of the two species, as to appearance and variable structure. The proportions of the burrow and the thickness of the silk tube are to me the only clue to the identity of the genus before the occupant is reached. The largest burrow, that of No. 137, gave the following dimensions: length, 20 cm.; average diameter, 15 mm.; trapdoor, 22 x 17 mm., of soil, moss and grass-bits, and a small leaf. Some of the burrows are surprisingly short, being only 10, or even 6, cm. long.

Number 137 was taken Oct. 31, 1907, and had some sixteen or more young, about 5 mm. long, running about in the deeper end of the tube. Fourteen of these were brought into the laboratory and placed in vials. Most of these burrowed into the soil at once and made little trapdoors about 3 to 4 mm. wide. They were not properly cared for, but, almost two months after being brought in, they replaced their doors when same were removed.

It may be noted here that these young, direct from the mother's burrow, both in this species and in *E. versicolor*, are readily referable to their respective genera by the characters of the cephalothorax and the abdominal markings; while the sternum, pedipalps and legs give no clue to the genus to which the specimen belongs. This is significant, if the characters earliest established in ontogeny are of most importance in classification.

**Eurypelma californica** Auss. Verh. zool.-bot. Gessell. Wien., 1871, p. 214.

(Plate XVII.)

The genus *Eurypelma* is found in California at least as far north as San Mateo County, in the outer Coast Ranges. It used to be common about Stanford University, a few specimens being deposited in the entomological collections here, but it seems to be rare or local about here now. One or two are picked up and brought in almost every year, two large ones having been taken this year—one, a male, picked up while crossing a road (October), the other, a female, found under a rock on the top of one of the



foothills behind the University (March). Many a days' search thru the lowlands and over the foothills, during the last ten months, had left me without finding a single specimen. Just recently, however, my friend, Wm. F. Derby, discovered two local colonies on Jasper Ridge, amongst the foothills, some three miles west of the University, and brought in a live female to prove his find. Returning to one of these colonies together, we secured several specimens, all females, and noted carefully the nesting habits.

I have before me one male from Ventura Co., three from San Diego (San Jacinto), three from Santa Clara Co., and one from Madera Co. (North Fork), also several females, including fifteen from the Jasper Ridge colonies, none of the females having been studied to any extent, however. In addition to these is an interesting series of seven small males and two females from Fort Wingate, N. Mex., kindly loaned me by Mr. Karl Coolidge, of Palo Alto.

Eight species of *Eurypelma* have been ascribed to the United States (including Lower California), four of which have been described from the male alone, two from the female alone, only two having both male and female described. Five of these species are attributed to California, only one of which has both sexes described, two known only from the male, two only from the female. Simon, in his "Liste des Espèces \* \* \* etc.," gives a key to the males of five species, omitting *E. liogaster* because the diagnosis given yields no characters not common to all the others he recognizes, and of course *E. californica* and *E. rileyi*, the males of which have not been described.

A careful study of my material, with reference to the characters selected by Simon as of greatest importance, does not permit me to determine satisfactorily the species that should be represented in the series, and I prefer to group the Californian specimens under the oldest name, *E. californica*, until I have opportunity to collect and examine a much larger series, from many localities.

This is the well-known, large hairy tarantula of the South-west. It is popularly known to dig in the ground, altho, according to Simon, few of the *Aviculariinae* make a true excavation. I find in an old number of *Science* (1884, III, 62, "Notes and News," p. 467) an interesting note which I will quote, in part. Speaking of *Cteniza californica*, it says: \* \* \* "its trapdoor nest is usually



placed in museums beside the tarantula (*Mygale hentzi*), and erroneously labeled as the tarantula's nest. This popular error \* \* \* \* is stranger, since the tarantula is usually too large to enter the nest of *Cteniza*, and **itself makes no nest**, occupying crevices in the ground or under stones, spinning a small web." Perhaps another record of this "popular error" is in Ausserer's remark, after his description of *E. steindachneri* (Verh. z.-b. G. Wien, 1875, p. 200), which says: " \* \* \* \* das Nest, an dessen Grunde das Thier in der Regel sitzt, ist circa ein Schuh tief, hat kaum ein Zoll im Durchmesser, und der Deckel passt so genau, dass er nur mit grösster Mühe vom Boden unterschieden werden kann." What Ausserer means by "Deckel" is fully explained on page 128 of his paper, where *Eurypelma steindachneri* and *Cteniza californica* are cited, with some other species, as examples of the spiders building a "Korkdeckelnest (Cork-covered nest)."

I am not now ready to believe that any of our *Eurypelmas* make a trapdoor of any kind. The loose webbing, common at the entrance of the many burrows observed in the Jasper Ridge colonies, is hardly less conspicuous than the open hole. The site of each of these colonies is adobe soil, with much outcropping of rock fragments, in open, grassy spots on the hill-sides. There is no evidence that these spots have ever been cultivated.

The burrows were mostly alongside of rocks, commonly bending under the rock if it was a small fragment; a few burrows were one or two feet distant from the nearest rock. The entrances are sometimes nearly circular, but usually quite irregular in shape, and were more commonly loosely "spun up" than open. The burrows are from 20 to 40 cm. long, very irregular in diameter and form, and exhibited little or no web-lining except near the entrance. They are undoubtedly dug by the spiders. No males were found.

When disturbed and placed out on the ground, these spiders hold the abdomen up, waving the long spinnerets about. Their movements are very sluggish and little fight is shown when disturbed. The elevating of the abdomen may be intended to frighten away the intruder; but as a fine mesh of silk is spun from the active spinnerets as the spider slowly walks along, the real purpose of the action may be to ensnare or discommode an attacking "tarantula wasp" (*Pepsis*), their worst enemy. Upon continued interference, the abdomen is lowered, the fourth pair of legs raised and their metatarsi rubbed against the posterior portion of the

abdomen above. This peculiar action may be largely responsible for the bare spot on the rear of the abdomen in many specimens. None of the series secured upon Jasper Ridge was so denuded, but several individuals, both male and female, in the other material of the collection here, have such a bare space above the spinnerets. One large male, brought into the laboratory early in the Autumn and kept alive for several months, had a conspicuous bare spot and would rub this spot with its metatarsi IV when disturbed from behind. If worried from in front, however, the first pair of legs would be raised, the whole body slowly swung backwards, followed by a quick spring forward, scarcely over two centimeters, however, bringing down the front legs with considerable force.

Altho I have made no particular study of the matter, as yet, I do not believe that the bare spot on the abdomen has any value as a specific, or other taxonomic, character. While the color characters are quite constant in my Jasper Ridge series, considerable variation exists in the New Mexican series mentioned above.

The first specimen brought in by Mr. Derby was secured by pouring water down the burrow. That these tarantulas come out readily when water is poured into their holes, is a well-known fact in California, and many a small boy and camper finds amusement in the performance, as also in putting two individuals together and having a "tarantula fight."

**Brachythele longitarsis** Simon ( $\sigma^7$ ) Ann. Soc. ent. Fr., 1891, p.305;  
( $\text{♀}$ ) Actes Soc. Linn. Bord., 1891, p. 319.

(Plate XVIII, figs. 1-2; XIX, fig. 1).

Reported from California, Idaho, and Texas, this form seems to have a wide distribution. It is abundant about Stanford University, San Jose, etc., and seems to hold its own in fields and orchards plowed annually. It is common alike in the valley levels and on open hillsides all thru the hills, at least up to 1600 feet and undoubtedly higher. I secured it in Sonoma County, between Guerneville and Forestville, and in Monterey County, near Carmel. Specimens are in the collection here from San Diego County.

Both sexes of this species are described from immature specimens (i. e.,  $\text{♀}$  19 mm. long,  $\sigma^7$  15 mm. long), and the original descriptions do not do justice to some of the important adult characters. However, it is evident that Simon has more recently

received larger specimens, and has added (Hist. Nat. des Araign., II, Supp., 1903, p. 964), a few points of great help to one working with mature individuals of either sex. I have before me about fifty specimens, including six males. At least half of the females measure over 30 mm. in length, one of the largest measuring 46 mm. long, cephal. 17 x 14 mm., abdomen 21 mm. long. The scopula is very thin in half-grown, and smaller, specimens, but very dense in the mature individuals. On tarsi I and II it is uninterrupted, on tarsi III it may or may not be longitudinally bisected by a more-or-less distinct setose line, while tarsi IV have a very prominent row of black setae bisecting the scopula, comparable to that illustrated as characteristic of *Ischnocolus* and its relatives, but said to be present in *Brachythele subcalpetana* (loc. cit., I, 1892, p. 180), tho nowhere mentioned in connection with *B. longitarsis*. Simon has added (loc. cit., II, p. 965) that the density of the scopula varies according to the species, and in the larger (*B. longitarsis*) it forms under the claws, tufts comparable to the fascicles of the *Aviculariinae*. This is quite true, and the third claw, readily seen in young specimens, is so well concealed amidst these tufts that only careful dissection will reveal it. It is easily scraped off in trying to scrape away the surrounding hairs. In the male of this species, tibiae I are provided with the obtuse tubercle bearing two unequal, closely contiguous spines. This is also true of a specimen loaned me by Mr. W. F. Allen, of Pacific Grove, the spider coming from a bunch of bananas, shipped in, presumably, from the west coast of Central America. It is evidently of another species, but was not determined beyond the genus.

Our *Brachythele* does not spin a large flat web, after the manner of the *Agelenids*, as do the *Diplurinae*, in general, according to Simon. On the contrary, it digs a deep burrow in the soil, lining only the upper fourth, or less, of the tunnel with considerable or very little web. Occasionally, however, more or less of a web is spread without the cavity, if the site selected is in very loose soil or in long grass; but usually there is little or no suggestion of an outside web, at least within the limits of my experience. Frequently the mouth of the burrow is "spun up," or closed, with silk, compactly at the surface (Plate XX, fig. 1), or loosely and down for some 5 or 6 cm.; my only explanation for this habit being that the spider has had a full meal and wishes to rest undisturbed. It seems to have no peculiar connection

to moulting or breeding time, as I supposed at first. The burrows enlarge considerably below the upper half, and commonly become nearly horizontal below, with rough, irregular, usually unlined walls, except at egg-laying times,—nests with cocoons usually being well-lined. The "cocoon" is fastened to the roof of the cavern. Egg-laying is probably in early summer, but I have no exact data yet as to the month. Numerous cocoons, found in September and October, contained the exuviae of the young's first moult; but the young were gone in all cases. Over fifty of these exuviae were counted from one cocoon. Cast skins of the adults are commonly found in both occupied and deserted burrows, in the Autumn.

Mating time is in the Autumn, when the males may frequently be found walking about on the surface of the ground. Oct. 30th, a pair were taken from one burrow. The female was met with several centimeters up the tunnel, she being more aggressive than usual. The male was down below, and, unlooked for and unexpected, was injured in one palpus and one leg as I was roughly following the long burrow to its end; but the two were brought alive into the laboratory and put into a spacious cage together. The next day the male was found partially wrapped in silk, with the female standing over his remains, still feeding. Later she dug something of a cavity in the soil of the cage and lined the entrance and vicinity with considerable silk. One male was found alone in a well constructed, rather long burrow. It may not have dug the cavity itself, however, as it may have merely appropriated an abandoned one. Males have been found under rocks and planks.

Brachythele is common on Jasper Ridge, mentioned above in connection with Eurypelma. Mr. Derby and myself being surprised to find a Brachythele at the bottom of a few of the burrows amidst the colony of Eurypelma. Similar soil, etc., only a stone's throw away, contained many Brachytheles, but no Eurypelmas. Hence we had a good chance to compare the nesting habits of the two very different species. In fact, we looked in vain for some external evidence sufficient to identify with certainty the genus of the occupant of the burrow. Altho the burrows of Brachythele undoubtedly average more in length and are not so apt to be close to rocks, so much variation exists as to the depth, various diameters, shape, directions, web-lining, proximity to rocks, etc., that we found it impossible really to know

which species we were digging out until the inmate itself was reached.

When disturbed, *Brachythele* takes a most spirited attitude of defense and usually grabs quickly and savagely at whatever is thrust toward it. If its fangs can penetrate the object introduced, it holds on tenaciously; but if the object is a hard stick or glass rod and resists the insertion of the fangs, the spider hesitates a moment, then hastily retreats into the darkest corner available. Upon further disturbance, and brought to bay, the animal flops over on its back, and with legs and chelicerae spread, fangs fully extended and often dripping with liquid, awaits an opportunity to get in effective work on its tormentor.

Specimens in captivity go eagerly for water when it is provided after considerable neglect. They spread their chelicerae in sucking up the fluid. They capture and devour individuals of their own kind, as well as others, put in with them. One large female caught and ate a small lizard, of the genus *Gerrhonotus*, of some twelve centimeters length. Carabid beetles are favorite food and their eletra are commonly found in the burrows out in the field. A large tenebrionid, *Eleodes*, was placed in a cage with several tarantulas, at different times; but not only does the spider fail to attack the beetle, but it will either walk away from it or permit itself to be literally walked all over by the tenebrionid. This same beetle spent some two months in a cage with a large male of *Eurypelma*, and is still alive; while a small *Sceloporus* lizard spent but two or three days in the cage before meeting the fate of its cousin *Gerrhonotus*.

*Brachythele* also suffers considerably, in nature, from the attacks of the tarantula hawks, *Pepsis*.

***Atypoides riversi*** Cambr. Proc. Zool. Soc. Lond., 1883, p. 354.

This species has been well described by Rev. O. P. Cambridge. It has been reported from Berkeley, from Santa Clara Co., and from the San Bernardino Mountains. I find it abundant along shaded streams and in thickets in the foothills and mountains wherever I have been, on both sides of the Santa Clara Valley, between Guerneville and Forestville in Sonoma Co., and in the pine forest of the Monterey Peninsula. It is probably to be found thruout the Coast Ranges of California, in all forested areas, if not also in the Sierras. I have seen no males, but have no reason to question the description and drawings of Cambridge.



The "turrets" are open, no door closing the entrance. Sometimes the edges of the chimney are drawn together with numerous strands of silk, effectually closing the entrance, this being done, apparently, at the pleasure or need of the individual, as in *Brachythele*, and not being a seasonal habit of the species. The burrow is long and well lined with a white silk tube of about the thickness and whiteness of that of *Eutychides versicolor*. The tunnels are commonly considerably reduced in diameter for the last two centimeters, making a snug fit for the spider, and here it usually snuggles down tightly when the digging has reached the limit necessary to secure the specimen. Hard soil seems to be preferred by this spider, either sandy or adobe. Tho the upper portion of the nest may be thru loose vegetable mould, the lower portion is sure to be in compact soil. The turret may be supported by grass, etc., or standing alone; it is made of silk within and of soil without, decorated or not with whatever is close at hand, whether as a matter of chance or purpose, a matter of convenience or protective coloration, of adornment or contributing to the strength of the structure, it is not easy to decide. A neat type is one well decorated with moss and leaves, small twigs, etc., and with a pale green rim of bits of the common drooping tree-lichen, *Ramelina* (Plate XX, fig. 4); another is one with pine-needles fastened all over the exterior, the needles pointing in all directions (Plate XX, fig. 3), common at Pacific Grove.

Several of these spiders were brought into the laboratory and they readily constructed burrows and turrets in normal manner, even using loose moss that was placed near the turrets several days after the completion of the nests.

Young, taken from the nests of the parents, very soon dug each its own burrow and built its chimney, whether put with the mother in one large battery jar, or alone in individual vials. It was very interesting to find them up at the mouths of their tubes, waiting for food material to come along. This was at first only about dusk, but later on was at any time on dark days. Small ants, placed in the jars or vials, were caught and carried into the lower regions of the burrows. Small green aphids were, by one brood especially, eagerly taken from the forceps and carried to their fate. The young spiders would jump out after a passing ant or aphid as far as they could reach, always holding on to the rim of the turret with the claws of the fourth pair of legs. They commonly missed their pray, however, jumping too soon or too

late and often when the insect was considerably out of their reach. A hasty retreat into the tube always followed these efforts to secure a meal.

**Aliatypus** gen. nov.

As already stated, the finding of the male of *Atypoides californica* Banks has shown that the species can no longer be referred to that genus; nor can it, in truth, be placed in any other genus now described. Tho the female is quite similar to that of *Atypoides riversi*, the males of the two species are so different in notable structures that generic separation of the two is quite necessary. The new genus may be known by the following characters:

Cephalothorax rather flat caudad, broader than in *Atypoides*; thoracic pit short, round; caput lower and more rounded at the summit; eyes about the same, situated on the nearly perpendicular slope of the anterior edge, eye-tuber nearly obsolete except portion bearing anterior median eyes, which is more pronounced in the male; chelicerae in female gibbous at the base above (Plate XV, fig. 6), lower and more rounded than in *Atypoides* (fig. 7), in male not gibbous basally (fig. 2), and without curved projecting apophysis of *Atypoides* (fig. 8); abdomen shorter, more rounded, with a sub-triangular glossy spot on the anterior slope above, this spot somewhat fine-setose and with a transverse row of much larger setae, normally four in number, on its posterior edge (glabrous in *Atypoides*), post-abdomen well above spinnerets, which are much stouter, with shorter thicker joints, the outer inferiors nearly as large as the inner; sternum much larger, with six impressions, the anterior pair often so close to the margin as to be hidden by coxae I; labium much wider than long (figs. 1 and 5); coxae of pedipalps, in male, with a short lobe at the cephalo-distal corner (fig. 1), almost as in *Hexura* (Simon: Hist. Nat. des Ar., II, p. 971, fig. IIII), coxae P in female hardly different from same sex of *Atypoides*, pedipalps of male (fig. 3) as long as legs I, relatively twice as long as in *Atypoides* (fig. 9), bulb with long slender conductor; legs robust, many spined.

The generic name is derived from *alius* and *Atypus*, signifying "a different *Atypus*."

It is interesting to note that the pronounced gibbosity at the base of the chelicerae above in the female of *Atypoides* (fig. 7), is in the male exaggerated into a long, curved projection (fig. 8); while the homologous, but less pronounced, gibbosity of the female of *Aliatypus* (fig. 6) is almost obsolete in the male of that



genus (fig. 2). In the length of the pedipalps, the male of *Atypoides* is of the more common type; while *Aliatypus* is conspicuous for the great elongation of certain segments of those organs (cf. figs. 3 and 9).

***Aliatypus californicus***, Banks. (*Atypoides*). Jour. N. Y. Ent. Soc., IV, 1896, p. 88.

(Plate XV, figs. 1-6; XIX, figs. 3-4).

Adult ♂ (Plate XIX, fig. 3)—Length 12 mm., cephalix 5 x 4 mm., abdomen, about 5 mm. long. Cephalothorax shiny, glabrous, excepting the margins which are minutely black-setose, coarser than in female, pale yellow, paler than in female, the median line and borders of the caput olive-tinted; anterior eyes closer together and eye-tuber a little more projecting than in female; chelicerae very slender, not gibbose at the base as in female, but the inner edge swollen into a rounded setose ridge anteriorly; abdomen grayish, finely black-setose and with scattered much larger black setae, fewer and more scattered than in female; sternum glossy flesh-color, darker and yellow in female; pedipalps as long as legs I, coxae with small lobe, trochanters twice as long as wide, femora and patellae reddish, femora very long and slender, longer than femora I, nearly straight, conspicuously black-setose below on the apical half, patellae long, club-shaped, long-setose below on apical half, tibiae the same, but longer and gibbous below near the apex (Pl. XV, fig. 3), tarsi of generalized type, bulb (fig. 4) very angular, black basally, opaque glossy white below, the broad, flat, angular spine reddish, a very slender, blackish conductor extending out along edge of spine, almost to its suddenly contracted tip; legs more slender than in female, coxae and femora pale flesh-color below, trochanters and rest of leg-segments yellowish, tarsi and metatarsi conspicuously long and slender. (Described from my Nos. 98 and 100).

I will not add further to Banks' description of the female. I have collected some fifty individuals, the largest measuring 11 mm. long.

I have not yet found this spider outside of the foothills and mountains on each side of the Santa Clara Valley, Santa Clara and San Mateo Counties, but it is probably not at all limited to such a small range. Mr. R. W. Doane secured the type material on Black Mountain, Monto Bello Ridge, of the Santa Cruz Ranges. It is common at Alum Rock Park and in the Mt. Hamilton Range at least up to 2900 feet elevation. It is a trapdoor species and seems to have a decided preference for fine compact sandy soil, especially where exposed along streams, roadside banks, etc. Where found it is usually very common. Occasionally it is found in sandy adobe. It is commonly associated with *Eutyichides* and *Atypoides*.

The burrow is comparatively long, simple, with simple trapdoor. I have seen no evidences of branches of any type, nor any suggestions of extensions above the surface. The silk lining is so meagre as to be practically indiscernible. The banks usually have little or no vegetation upon them other than short scattered moss, and the traps usually are of soil and silk only, or with a few

bits of moss or grass on the outside. Burrows found in dry exposed banks, from September until the first rains in December, had the traps plastered down firmly with soil. A few along flowing streams in the shaded redwood ravines were not so closed, tho in a roadside bank, only a few rods up the canon side, all the nests were plastered up. At the bottom of a nest, so closed, was always a spider, in more or less dormant condition. Doors sealed up in this way are harder to see, as a rule, than when normally fastened at the hinge only. Many of the burrows were found by mere accident, as it were, in digging promiscuously, or following out the burrow of something else. The burrows of small specimens are not easy to distinguish from those of certain mining bees, tiger beetles, etc., if the trap is left out of the comparison. None was found with sealed doors from the end of December to the end of April. No observations were made during May, but all nests found during June had the traps firmly plastered down as in September and October. Undoubtedly this hibernating period is coincident with the dry season of the Californian coast. The dimensions of two of the largest nests examined are: No. 199 trap 21 x 15 mm.; burrow 16 cm. long, nearly straight, outer half 15 mm. diam., inner half 20 mm. No. 203, trap 18 x 13 mm.; burrow 25 cm. long, 18 mm. diameter, with two decided bends.

#### CONCLUSIONS.

It is evident that the knowledge of our West Coast Araneae theraphosae is far from perfect, and much interesting work is yet to be done. The taxonomic work is yet none too satisfactory and many gaps in the life histories are waiting to be filled in. Questions in distribution must be many and extensive, as only two forms are reported from Washington and Oregon, with one record between there and Mariposa County, California. Nevada seems to have not a single record, and Idaho has but two. Even in the South-eastern States the situation seems to merit considerable attention, and in the South-west the genus *Eurypelma* is a study in itself. While there are probably many taxonomic questions awaiting the attention of students, it is very apparent that conclusions reached in the laboratory should be based upon as large series as possible and accompanied by extensive field observations; for I find, in certain of the species discussed above, variations comparable to specific differences claimed by some authors.

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The photographs presented herewith were taken by Mr. R. W. Doane, mostly from preserved material. The drawings are original, with the exception of figs. 8 and 9 of Plate XV, which two are copied from Cambridge.

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## EXPLANATION OF PLATE XIII.

*Eutyichides versicolor* ♀ (Figs. 1-18), ♂ (Fig. 19)

- Fig. 1—Sternum and labium, No. 195.  
 Fig. 2—Sternum and labium, No. 234.  
 Fig. 3—Sternum and labium, No. 60.  
 Fig. 4—Sternum and labium, No. 162.  
 Fig. 5—Sternum and labium, No. 200.  
 Fig. 6—Sternum and labium, No. 193.  
 Fig. 7—Cephalothorax, lateral aspect, No. 234.  
 Fig. 8—Cephalothorax, lateral aspect, No. 128.  
 Fig. 9—Dorsal abdominal markings, heavy, No. 195.  
 Fig. 10—Dorsal abdominal markings, light, No. 234.  
 Fig. 11—Cephlx. and chelicerae, dorsal aspect, No. 123.  
 Fig. 12—Cephlx. and chelicerae, dorsal aspect, No. 60.  
 Fig. 13—Labium, No. 164.  
 Fig. 14—Labium, No. 163.  
 Fig. 15—Fang and rake of chelicerae, from below, No. 273.  
 Fig. 16—Fang and rake of chelicerae, from within, No. 273.  
 Fig. 17—Fang and rake of chelicerae, from below, No. 128.  
 Fig. 18—Fang and rake of chelicerae, from within, No. 128.  
 Fig. 19—Genital bulb left, two views, No. 269.

*Aptostichus stanfordianus* ♀ (Figs. 20-31.)

- Fig. 20—Fang and rake of chelicerae, from within, No. 120.  
 Fig. 21—Fang and rake of chelicerae, from below, No. 181.  
 Fig. 22—Labium, No. 179.  
 Fig. 23—Labium, No. 120.  
 Fig. 24—Labium, No. 137.  
 Fig. 25—Cephlx. and chelicerae, dorsal aspect, No. 213.  
 Fig. 26—Dorsal abdominal markings, heavy, No. 213.  
 Fig. 27—Dorsal abdominal markings, light, No. 102.  
 Fig. 28—Cephalothorax, lateral aspect, No. 213.  
 Fig. 29—Sternum and labium, No. 213.  
 Fig. 30—Sternum and labium, No. 266.  
 Fig. 31—Sternum and labium, No. 177.

*Aptostichus atomarius* ♀ (Fig. 32).

- Fig. 32—Sternum and labium, No. 209.

## EXPLANATION OF PLATE XIV.

*Eutyichides versicolor* ♀ (Figs. 1-16).

- Fig. 1—Tarsal claws, leg IV, inner faces, No. 110.  
 Fig. 2—Tarsal claws, leg I, outer faces, No. 110.  
 Fig. 3—Tarsal claws, leg II, inner faces, No. 60.  
 Fig. 4—Tarsal claws, leg IV, inner faces, No. 60.  
 Fig. 5—Eye tuber, lateral aspect, No. 195.  
 Fig. 6—Eye tuber, lateral aspect, No. 128.  
 Fig. 7—Eye tuber, lateral aspect, No. 234.  
 Fig. 8—Eye tuber, caudal aspect, No. 128.  
 Fig. 9—Eyes (anterior row above), No. 200.  
 Fig. 10—Eyes (anterior row above), No. 229.  
 Fig. 11—Eyes (anterior row above), No. 151.  
 Fig. 12—Eyes (anterior row above), No. 234.  
 Fig. 13—Eyes (anterior row above), No. 131.  
 Fig. 14—Patella of leg III, anterior face, No. 195.  
 Fig. 15—(P) Tarsus of pedipalps, No. 60.  
 (1) Tarsus and metatarsus of leg I, No. 60.  
 Fig. 16—Coxa of pedipalp, ventral face, No. 60.

*Aptostichus stanfordianus* ♀ (Figs. 17-29).

- Fig. 17—Coxa of pedipalp, ventral face, No. 120.  
 Fig. 18—Patella of leg III, anterior face, No. 120.  
 Fig. 19—Eyes (anterior row above), No. 137.  
 Fig. 20—Eyes (anterior row above), No. 213.  
 Fig. 21—Eyes (anterior row above), No. 187.  
 Fig. 22—Eye-tuber, lateral aspect, No. 137.  
 Fig. 23—Eye-tuber, lateral aspect, No. 213.  
 Fig. 24—Eye-tuber, caudal aspect, No. 137.  
 Fig. 25—Tarsal claws, leg I, inner faces, No. 120.  
 Fig. 26—Tarsal claws, leg II, inner faces, No. 120.  
 Fig. 27—Tarsal claws, leg III, inner faces, No. 120.  
 Fig. 28—Tarsal claws, leg IV, inner faces, No. 120.  
 Fig. 29—(P) Tarsus and "tibia" of pedipalp, No. 228.  
 (I) Tarsus and metatarsus of leg I, No. 228.  
 (II) Tarsus and metatarsus of leg II, No. 228.

*Aptostichus atomarius* ♀ (Figs. 30-32).

- Fig. 30—Eye-tuber, caudal aspect, No. 209.  
 Fig. 31—Eye-tuber, lateral aspect, No. 209.  
 Fig. 32—Eyes (anterior row above), No. 209.

EXPLANATION OF PLATE XV.

*Aliatypus californicus* (Figs. 1-6).

- Fig. 1—Ventral aspect of ♂ (abdomen omitted), No. 100.  
 Fig. 2—Lateral aspect of ♂, No. 100.  
 Fig. 3—Pedipalps of ♂, No. 100.  
 Fig. 4—Genital bulb, four aspects, showing "conductor" in "c" and "d", No. 100.  
 Fig. 5—Ventral aspect of ♀ (abdomen omitted), No. 32.  
 Fig. 6—Lateral aspect of ♀ (abdomen omitted), No. 32.  
*Atypoides riversi* (Figs. 7-9.)  
 Fig. 7—Lateral aspect of ♀ (abdomen omitted), No. 317.  
 Fig. 8—Lateral aspect of ♂ (after Cambridge.)  
 Fig. 9—Pedipalp of ♂ (after Cambridge.)

EXPLANATION OF PLATE XVI.

- Fig. 1—*Eutyichides versicolor* ♀  
 Fig. 2—*Eutyichides versicolor* ♂  
 Fig. 3—*Aptostichus atomarius* ♀.  
 Fig. 4—*Aptostichus stanfordianus* ♀ (under alcohol).  
 Fig. 5—*Aptostichus stanfordianus* ♀ (regenerated leg I).

EXPLANATION OF PLATE XVII.

- Fig. 1—*Eurypelma californica* ♂  
 Fig. 2—*Eurypelma californica* ♀.

EXPLANATION OF PLATE XVIII.

- Fig. 1—*Brachythele longitarsis* ♂ (regenerated palpus).  
 Fig. 2—*Brachythele longitarsis* ♀ (regenerated leg I).

EXPLANATION OF PLATE XIX.

- Fig. 1—*Brachythele longitarsis* ♀ (from life).  
 Fig. 2—*Atypoides riversi* ♀.  
 Fig. 3—*Aliatypus californicus* ♂.  
 Fig. 4—*Aliatypus californicus* ♀.

EXPLANATION OF PLATE XX.

- Fig. 1—*Brachythele longitarsis*, web-covered hole.  
 Fig. 2—*Brachythele longitarsis*, open hole in grass.  
 Fig. 3—*Atypoides riversi*, turret with pine-needles.  
 Fig. 4—*Atypoides riversi*, turret with moss, etc.